Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	)	GN Docket No. 18-122
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11791
	)	
Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service	)	RM-11778

REPLY COMMENTS OF GOOGLE LLC

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August 14, 2019

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Over the course of this proceeding, ample information has been submitted to the Commission demonstrating how spectrum sharing in the 3.7–4.2 GHz band (C-band) can offer a unique opportunities to foster expanded wireless broadband service by point-to-multipoint (P2MP) service providers and flexible-use licensees, without constraining fixed-satellite service (FSS) operations. The Commission should act expeditiously to unleash the potential of this spectrum, which is fundamental to closing the rural digital divide, increasing Internet access competition, and promoting available and affordable fixed 5G service offerings to all Americans.

I. INTRODUCTION AND SUMMARY

The record in this proceeding reflects strong support for Commission efforts to reconfigure the C-band to advance U.S. leadership in 5G and help close the digital divide.[1] In addition to clearing C-band spectrum for flexible-use licensing, numerous commenters support allowing P2MP broadband services to share remaining C-band spectrum with incumbent FSS operations. Like Google, these commenters see the potential for P2MP offerings in the C-band to expeditiously provide wireless broadband connectivity to unserved and underserved communities, extending the benefits of 5G and high-speed internet to all Americans.

Submissions by P2MP providers demonstrate that they are ready, willing, and able to rapidly deploy high-speed broadband services to customers over shared C-band frequencies, and this additional spectrum is critical for that purpose. Contrary to some commenters' assertions, launching these new P2MP offerings would not complicate the C-band repacking process, limit or compromise operations by FSS earth stations in the repacked portion of the band, or prevent future clearing of additional C-band spectrum for flexible use. Additionally, commenters explain that the analysis and recommendations in the *Reed Study* can inform the Commission's rules for shared

[1] Public Notice, *Wireless Telecomms. Bureau, Int'l Bureau, Office of Engineering and Tech., and Office of Econs. and Analytics Seek Focused Additional Comment In 3.7-4.2 GHz Band Proceeding*, GN Docket No. 18-122, RM-11791, RM-11778, DA 19-678 (rel. July 19, 2019) (*Public Notice*).

P2MP use and enable more efficient use of C-band spectrum.[2] Even more spectrum can be freed for P2MP operations by eliminating full-band, full-arc registration practices that, as the record confirms, are not justifiable on any valid technical basis.

II. P2MP Providers Stand Ready to Provide Broadband Services Upon FCC Authorization of Sharing in the C-Band, and Authorizing this Service Will Promote the Public Interest.

P2MP service providers' comments demonstrate their desire to serve customers using shared C-band spectrum. Like Google, the Wireless Internet Service Providers Association (WISPA) continues to believe that "coordinated sharing among receive-only earth stations and fixed wireless [P2MP] is entirely feasible, would maximize spectral efficiency, and would provide millions of Americans, especially in rural areas, access to broadband services at gigabit and near gigabit speeds."[3] Airspan sees the *Reed Study* as confirming "significant opportunities to bring fixed wireless [P2MP] access to tens of millions of Americans in shared C-band spectrum."[4] Likewise, Cambium notes that "service providers, enterprises, governmental and military agencies, oil and gas, railroad and utility companies, Internet service providers[,] public safety first responders . . . and the Americans they serve, could benefit greatly" from new P2MP services in the C-band.[5] Frontier and Windstream encourage the Commission to expeditiously explore

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[2] *See* Letter from Wireless Internet Serv. Providers Ass'n, Google LLC, & Microsoft Corp., to Marlene H. Dortch, Secretary, FCC, in GN Docket No. 18-122, at Attachment (filed July 15, 2019) (*Reed Study*).
[3] *See* Comments of Wireless Internet Serv. Providers Ass'n at 2 (*WISPA Comments*). Unless otherwise noted, all citations to comments reference submissions in GN Docket No. 18-122, RM-11791, RM-11778 filed on Aug. 7, 2019.
[4] Comments of Airspan Networks Inc at 2 (*Airspan Comments*).
[5] Comments of Cambium Networks, Ltd. at 1 (*Cambium Comments*).

the *Reed Study's* recommendations to "accelerate multi-billion-dollar broadband investments to unleash faster broadband for even more rural Americans" and help "accomplish its dual goals of promoting 5G leadership and closing the digital divide."[6] Frontier and Windstream support "smart rules" enabling fixed P2MP deployments as "another key tool in the toolbox to reach the hardest to serve rural Americans."[7]

The record reflects that P2MP providers including WISPA's members are poised to begin offering services as soon as the Commission adopts modest changes to its rules, operators adjust coordination processes, and companies certify new equipment.[8] Airspan, a supplier of 5G, citizens broadband radio service (CBRS), and rural WISP fixed wireless equipment, expects that it can "rapidly adapt existing equipment to be used for C-band operation."[9] Airspan adds that its "experience implementing spectrum sharing techniques with CBRS as well as coordination based fixed wireless licensing (via FCC ULS and Part 101)" informs its conclusion that the *Reed Study's* "results and recommendations are feasible to implement rapidly and cost-effectively."[10] Similarly, Cambium, a manufacturer of Wi-Fi, point-to-point, and P2MP broadband solutions for a variety of spectrum bands, explains that designing and coordinating P2MP systems on

[6] Comments of Frontier Commc'ns Corp. & Windstream Servs., LLC at 4 (*Frontier/Windstream Comments*).
[7] *Id.* at 2.
[8] *See WISPA Comments* at 8.
[9] *Airspan Comments* at 2.
[10] *Id.*

a site-specific basis, taking all surrounding earth stations into account and fully protecting those operations, is "readily achievable."[11]

Commenters who argue that P2MP operators already have enough available spectrum and are undeserving of any additional frequencies misframe the argument before the Commission.[12] These commenters assume that spectrum opened for P2MP broadband links must be taken from other users and ignore the "win-win-win" scenario outlined in the *Reed Study* and *Public Notice*. P2MP offerings would use spectrum *not available to mobile* because of current C-band needs, *without reducing spectrum availability for FSS*. With access to additional spectrum, P2MP operators would have more options to provide broadband services, particularly where unlicensed spectrum is congested and operators controlling licensed frequencies have been unable or unwilling to lease spectrum. In short, whatever P2MP service can be provided in C-band spectrum on a shared basis with FSS would not detract from either new flexible-use licenses or continued C-band delivery of video programming and, therefore, will provide an additive benefit to the public.

Furthermore, fixed wireless broadband providers make clear that their need for additional spectrum is real. Cambium has first-hand knowledge of the "need for additional spectrum for fixed wireless uses" from its customers' experiences in other spectrum bands, and notes that C-band spectrum is "particularly well-suited to fill this

[11] *Cambium Comments* at 2.
[12] *See, e.g.,* Comments of AT&T at 13; Comments of the C-Band Alliance at 20 (*CBA Comments*); Comments of Satellite Indus. Ass'n at 2 (*SIA Comments*).

need."[13] Airspan notes that small rural WISPs have an "immediate need of additional sub-6 GHz P2MP spectrum to service under-connected rural areas."[14] The Commission should quickly capitalize on this opportunity to increase spectrum access for P2MP "operators that are ready to deploy, but who lack spectrum access in a local area."[15]

III. P2MP Offerings Using Shared C-Band Frequencies Will Not Limit Current or Future Efforts to Repurpose FSS Spectrum for Flexible Use.

Claims that allowing shared use of C-band frequencies between FSS and P2MP services would harm repacked FSS earth stations' operations or hamper future efforts to add more flexible use licenses are incorrect.[16] Shared P2MP operations will avoid causing harmful interference to repacked earth stations. Indeed, Professor Reed's study accounts for the worst case scenario by examining each of the more than 18,000 previously registered, newly registered, and registration-pending earth stations and explaining that co-channel use is feasible with exclusion zones much smaller than previously proposed.[17] Because the *Reed Study* assumes co-channel operation for every earth station, repacking those stations from the lower part to the upper part of the C-band would not affect the study's conclusions.[18] Real-world evidence confirms this assessment. As Commission records show, broadband systems across the country

[13] *Cambium Comments* at 1.
[14] *Airspan Comments* at 3.
[15] Comments of Public Interest Spectrum Coalition (PISC) at 14 (*PISC Comments*).
[16] *See, e.g., CBA Comments* at 19-20; Comments of the Content Companies at 13-14; Comments of CTIA at 11-13; Comments of the Nat'l Ass'n of Broadcasters at 8-10 (*NAB Comments*); Comments of T-Mobile USA, Inc. at 21; Comments of N. Am. Broadcasters Ass'n at 3-4; Comments of Verizon at 17.
[17] *Reed Study* at 4, 39.
[18] Comments of Google LLC at 6, 19-20 (*Google Comments*).

today are operating co-channel with nearby C-band earth stations, even at distances as small as *19 meters*.[19] Claims that P2MP sharing of the band with FSS "would encumber the repacking process are therefore invalid."[20]

Permitting P2MP operations on a shared, opportunistic basis with protection for FSS satellite systems by rule would resolve concerns from some FSS commenters that P2MP links might preclude modified or additional earth station registrations.[21] In addition, P2MP operators are unlikely to rely solely on C-band for their broadband services and would also use frequencies in other bands to deliver service, thus facilitating flexibility in P2MP operations and coexistence with FSS operations. A fixed broadband provider might have to re-engineer its C-band operations in the unlikely event that a new C-band FSS terminal is installed very nearby, but frequency-agile P2MP radios would facilitate this process.

This approach to avoiding interference is consistent with many P2MP systems' use of backup frequencies for their unlicensed operations today. Furthermore, the record supports Commission reliance on established procedures that already allow fixed link sharing of spectrum with FSS C-band earth stations.[22] For instance, CBRS operations at 3650–3700 MHz are required to protect FSS earth stations consistent with

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[19] *See* Reply Comments of WISPA in GN Docket No. 18-122, RM-11791, RM-11778, App. A at 8 (filed Aug. 14, 2019).
[20] Joint Reply Comments of WISPA, Google, and Microsoft in GN Docket No. 18-122, RM-11791, RM-11778 at 2 (filed Aug. 14, 2019).
[21] *See, e.g.,* Comments of the Church of Jesus Christ of Latter-Day Saints at 5-6 (*LDS Comments*); *SIA Comments* at 4-6; *NAB Comments* at 9.
[22] *See, e.g.,* Comments of the Broadband Connects Am. Coal. at 11-12 (*BCAC Comments)*; *PISC Comments* at 8; *WISPA Comments* at 8.

existing protection criteria in Part 90, Subpart Z of the Commission's rules, until the protection criteria in Rule 96.17 apply.[23]

Because P2MP deployments are at fixed geographic locations and operate on a directional, sectorized basis, as the Broadband Connects America Coalition notes, a "strict coordination requirement should remove any concern about harmful interference from P2MP to FSS earth stations."[24] P2MP systems are comparatively low-cost and easy to install, so reconfiguring them as needed to accommodate changed FSS earth station registrations is technically and economically viable. Indeed, P2MP operators should be nimble enough to coordinate mid-band spectrum use precisely because they are able to avoid the "high costs of trenching or hanging fiber and other wireline technologies in rural areas."[25] Coordination should be especially feasible if the Commission requires P2MP equipment to be frequency-agile across the 3.7-4.2 GHz range, as it should to ensure maximum opportunities for shared and repurposed uses of C-band spectrum.[26] As PISC observes, a "database with up-to-date IBFS location and operational data can quickly and inexpensively verify the coordination of any transmit point—including individual client locations—within the sector initially coordinated by a P2MP operator."[27] Having the "ability to quickly and inexpensively coordinate unused

[23] *See Google Comments* at 8-9.
[24] *BCAC Comments* at 12.
[25] *PISC Comments* at 19.
[26] *Google Comments* at 2.
[27] *PISC Comments* at 11.

spectrum" in this manner is "particularly promising in rural areas where earth stations are both less numerous and more widely dispersed."[28]

IV. The Record Supports Ending Current Full-Band, Full-Arc Coordination Practices That Impede Realization of the Commission's Broadband Deployment Goals.

Changes to "full-band, full-arc" protection are not only feasible, but essential to maximize the use of C-band in furtherance of the Commission's policy goals. The *Reed Study* assumed full-band, full-arc registration and protection for earth stations throughout the C-band in order to test a worst-case sharing scenario. The Commission, however, should heed calls in the record to enact a reasonable FSS registration policy that eliminates full-band, full-arc protections where they are not justified by actual operations. This policy modification will create additional opportunities to deploy P2MP systems without the restrictions associated with unnecessary co-channel coordination.

The Satellite Industry Association (SIA) defends full-band, full-arc protections by claiming that modifying the policy would prevent earth stations from easily repointing to new orbital locations because of interfering P2MP operations, effectively barring them from moving to a new satellite service provider.[29] This can be avoided, however, by updating earth station registrations to reflect new directional and frequency information, which the P2MP provider will use to avoid interference through routine coordination of frequency-agile operations. This process could be nearly instantaneous under an

[28] *Id.*
[29] *SIA Comments* at 5.

automated procedure, as discussed in Google's prior submissions.[30] The Commission can give FSS operators assured, continued operating ability by granting P2MP systems opportunistic sharing rights and adopting rules to protect registered FSS earth stations.

In its defense of full-band, full-arc protection, the Church of Jesus Christ of Latter Saints argues that authorization of sharing between FSS and P2MP could require "broadcasting on multiple satellites and/or multiple frequencies, which would reduce efficient use of the band and require regular adjustments to each individual earth station receiver."[31] The Church admits that it "uses only a portion of available bandwidth on a day-to-day basis," but "relies on full band protection to ensure against interference for its nationwide network and to adjust to dynamic conditions."[32] This practice may be "efficient" for the earth station operator, but it is wasteful of public spectrum resources and a roadblock to achieving the nation's broadband goals. Further, the Church's argument in support of full-band, full-arc protection contradicts SIA's claims that full-band, full-arc registrations are essential so that earth station operators can easily repoint earth stations to new orbital locations: The Church suggests that making such adjustments would require technician labor at each receiver, which is "simply not tenable."[33]

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[30] *See, e.g., Google Comments* at 6-7; Reply Comments of Google LLC in GN Docket No. 18-122, RM-11791, RM-11778 at 4-5 (filed Dec. 11, 2018); Comments of Google LLC in GN Docket No. 18-122, RM-11791, RM-11778 at 5 (filed Oct. 29, 2018); Comments of Google LLC in GN Docket No. 18-122 at 9-10 (filed May 31, 2018).
[31] *See LDS Comments* at 6.
[32] *Id.* at 5.
[33] *See id.* at 6.

While the National Association of Broadcasters (NAB) may be correct that full-band, full-arc protection allows earth stations to access other satellites and frequencies in case of unanticipated interference or equipment problems or failures,[34] earth station operators will retain flexibility under rules that allow opportunistic P2MP sharing while revising the overbroad full-band, full-arc policy. Coordination and existing spectrum database technologies will allow new P2MP operations in the C-band to accommodate future changes in frequencies, pointing angles, and satellite signals received by earth stations, as reflected by updated registrations in the Commission's IBFS database.[35] Full-band, full-arc earth station registrations vastly overstate the amount of spectrum actually used to receive satellite signals, impede coordination for unused pointing angles, and claim bloated levels of protection.[36] The Commission should modernize its registration rules for today's spectrum environment and thereby enable efficient use of the band in furtherance of its policy goals.

V. CONCLUSION

The record before the Commission allows it to expeditiously enact a flexible framework to repurpose a portion of the C-band for mobile operations, while allowing fixed P2MP systems to share spectrum with FSS earth stations in the repacked portion

[34] *NAB Comments* at 9.
[35] *Google Comments* at 6.
[36] *See, e.g., LDS Comments* at 5-7 (admitting that the Church uses "only a portion of available bandwidth on a day-to-day basis" but nevertheless "relies on full band protection," and stating that "the long-standing practice in the industry is to register earth stations indicating the range at which the earth station receives as opposed to the particular frequency assigned to it by the satellite operator for reception").

of the band. P2MP operators have voiced their ability and desire to begin offering services in the C-band shortly after the Commission updates its rules. Underserved rural areas, in particular, will benefit from these changes, spreading the benefits of the country's 5G leadership. The *Reed Study* and other record evidence establishes that launching these new P2MP offerings would not complicate C-band repacking, limit or compromise operations by FSS earth stations in the repacked portion of the band, or prevent future clearing of additional C-band spectrum for flexible use. Commenters have also shown that the Commission can accelerate the positive effects of freeing spectrum for P2MP operations by eliminating full-band, full-arc registration, which lacks persuasive justification given the Commission's goals to use spectrum efficiently, accelerate the 5G transition, and increase broadband deployment.

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August 14, 2019